Atherton, Charles,

Exposition relative to a discussion at the Institution of Civil Engineers on the capabilities of large classes of steamers.

Atherton

P. 2863

WOOLWICH DOCKYARD,
August 18, 1854.

Sr,

I take the liberty of submitting to your notice the accompanying Exposition on OCEAN STEAMERS, *and I solicit your attention to it, not as a matter of mere discussion, but on the ground that the Mercantile Capability of Steam Ships, on which economy of transport depends, is a subject of great importance and deserving of the attention of all interested in commercial affairs. It is to be hoped that this Exposition, together with the Tables on* STEAM SHIP CAPABILITY, *of which an extended Edition is now being published by* GRANT, *Woolwich, with a view to demonstrate the degree in which the prime cost* EXPENSES *of Goods Transport are affected by differences in the constructive* QUALITIES *of Steam Ships, will draw your attention to this subject of paramount importance to Commerce.*

I have the honour to be,

Sir,

Your obedient servant,

CHARLES ATHERTON.


HOPKINS

OCEAN STEAMERS.

On the occasion of a recent discussion in Parliament, a Member of the Council of the Institution of Civil Engineers is reported to have stated that, at a meeting of that body, "Mr. Anderton *had warned them against extending the size of Ships, as, beyond a certain size, the Ship would carry little else than its own fuel, and the speed would not be increased.*"—*Times*, 28*th Feb.* 1854.

This statement has evident reference to the remarks made by me, Mr. Atherton, in a recent discussion at the Institution of Engineers on the Capability of large Steamers; and this absurd version of the proceedings has been so promulgated and erroneously attributed to me, that I find it professionally due to myself to declare that it indicates a total mis-apprehension of the opinions, not only expressed, but written and delivered in by me for record at the Institution of Engineers on the occasion referred to; moreover, I feel myself called upon to protest against the proceeding, that any Member of the Council of Engineers should thus take advantage of his position as a Member of Parliament to re-agitate and pervert in Parliament a matter that has been the subject of protest and memorial on my part as respects the proceedings thereon of the Council of the Institution, and of consequent correspondence between the Council and myself; which correspondence had, as I supposed, been brought to a conclusion. Under these circumstances, I have no means of refuting the perversion of my professional opinions on the Capability of Ocean Steamers, which has thus been promulgated by a MEMBER of the COUNCIL of the INSTITUTION, other than that of publishing the following statement of my remarks as handed in by me for record at the Institution, together with the subsequent memorial which I addressed to the Council on the subject of this discussion; to which documents I have now added further remarks on the Capabilities of the large class of Ocean Steamers, to which public attention is being directed, as compared with vessels of ordinary size.

CHAS. ATHERTON.

Woolwich Dockyard,
20*th April*, 1854.

INSTITUTION OF CIVIL ENGINEERS,

15TH NOVEMBER, 1853.

DISCUSSION PROPOSED BY THE COUNCIL OF THE INSTITUTION "ON THE CAPABILITIES OF THE PROPOSED LARGE CLASS OF STEAMERS."

MR. ATHERTON observed, that for the purpose of discussion it became necessary to particularize the obligations of the respective projects under consideration, and he presumed that the "*large class of steamers*" alluded to in the programme of proceedings had reference to the following projects now before the public, viz. :—

1st. The project favourably noticed by a Committee of the House of Commons for effecting the passage between Holyhead and Kingston (a passage of 64 statute miles) at a postal speed of 22½ statute miles per hour ; the packet to be established for that purpose being proposed to have a displacement of 2,700 tons, and to be capable of attaining a maximum speed of 25 statute miles an hour, the intended Engines being denominated 1,600 Nominal H.P., but to be constructed for working up to 8,000 Indicated H.P.

2nd. The project now said to be undertaken by American Constructors to establish a communication between New York and Liverpool in 6 days ; the length of passage being about 3,250 nautical miles, and, therefore, demanding an average speed of 22 nautical miles an hour.

3rd. The project said to be undertaken in London for establishing a Steam Ship communication between England and Calcutta by vessels capable of carrying sufficient fuel for the whole voyage to Calcutta and back (being about 25,000 nautical miles), *without re-coaling*, at the *promised average* speed of 15 nautical miles an hour.

In the first place, Mr. Atherton observed on the necessity of investigating these projects with reference to the *best known example of already realised Steam Ship Capability*, rather than with dependence on *any* promissory, but, hitherto, not realised, scale of constructive improvement; that, in order to determine the Index Number or co-efficient (C) indicative of the relative degrees of constructive efficiency of different Steam Ships in regard to their locomotive capabilities, he (Mr. Atherton) had adopted the formula $\frac{v^3 \times \sqrt[3]{D^2}}{n.p.} = (C)$, or, Rule, multiply the cube of the velocity (v^3) by the cube root of the square of the Displacement (D^2), and divide by the actual working power (n.p.), by which Rule the relative degrees of locomotive capability of numerous ships, both in the Royal Navy and Merchant Service, had been tested; and whereby it has been found that the co-efficient or Index Number (C), as determined by the above Rule, was greater in the case of H. M. steam-sloop Rattler than in the case of *any other ship whatever*, whether in the Royal Navy or Merchant Service, that had hitherto come under his observation; and that, therefore, he (Mr. A.) regarded the constructive type or form of the hull of Rattler, and the co-efficient or number indicative of efficiency deduced therefrom, as the best realised data whereby to calculate the requirements for any contemplated service, such, for example, as the size of ship and power of engines required to fulfil the respective conditions of the projects above referred to. Adopting, therefore, this rule, and basing his calculations on the actual performance of H. M. steam-sloop Rattler, he (Mr. A.) had constructed a series of Tables for each of the three projects, assuming that Steam Ships built of iron, or wooden Ships built on the diagonal principle, *may be constructed of any required size*; assuming also, that the weight of hull and equipment would not exceed 40 per cent. of the load-line Displacement; also, that the total weight of the engine equipment would be 5 cwts. per Indicated H.P., of 33,000 lbs., raised 1 foot per minute, or 1 ton per Nominal H.P., of 336,000 lbs., raised 1 foot per minute; such being, very nearly, the actual weight of machinery in various examples of *present* marine engine practice; and, that the consumption of fuel need not exceed the rate of 4½ lbs., per hour, per Indicated H.P.; or 4 cwts. per day, per Nominal H.P., of the unit 336,000 lbs., raised 1 foot per minute; which is about the present minimum rate of marine engine consumption, the engines working up to their ordinary duty.*

* The extreme limit of speed capable of being achieved by a steam vessel of given size, will, of course, be dependent on the lightness of the hull and equipment, lightness of machinery per H.P., economy of consumption of fuel per H.P., and on the construction of the hull, and the engine adaptation thereto, being such as to give a high rate of locomotive performance. These are subjects of practical consideration; and it is impossible to assign any definite limits to promissory improvements, or to the hazards that may be ordinarily incurred in the pursuit of them by sacrificing strength to the attainment of lightness; but, as regards each of the above-mentioned particulars, the assumed data on which the Tables have been calculated, are believed to be favourable for the attainment of a high result, and such as have rarely, if ever, been combined in any one ship. It is therefore submitted that the results indicated by these Tables are of the highest order that present practice will justify being calculated upon, however sanguine may be the opinion as to the practicability of these results being surpassed.—(See "Steam Ship Capability," page 28.)

Calculating the requirements of project, No. 1, *on the above data*, Mr. ATHERTON came to the conclusion that a vessel of about 2,750 tons' Displacement, as proposed to Parliament, would not carry engines of greater weight than 1,375 tons' weight, working up *to* 5,500 *Indicated H.P.*; the maximum speed of which may not be expected to exceed 21 statute miles an hour; and that, to attain the *maximum* speed of 25 statute miles per hour, as required for the average postal speed of 22½ miles per hour, the Displacement of the vessel would require to be not less than 13,000 tons, the engines would require to be 26,000 *Indicated H.P.*, and the cost of the Ship, complete, would probably not be less than £533,000. Mr. ATHERTON, however, observed that the weight of 5 cwts. per Indicated H.P. is probably three times the weight which is involved in the present construction of railway locomotive engines, and though he would not venture to anticipate that the weight of marine engine machinery can be advantageously reduced to the scale of railway locomotive practice, he expressed the opinion that it has hitherto been only the prejudices of the public against high pressure steam on board ship, and, possibly, the trammels of legislative intervention, which have prevented marine machinery *for short passages*, like that now under consideration (viz., 64 statute miles), approximating, as regards *weight*, more closely to the railway locomotive principle and practice; and that if these difficulties be removed in the case now referred to, and the weight of marine engines be reduced to 3 cwts. per Indicated H.P., then a vessel of 2,750 tons' Displacement, as proposed for this scheme, would carry engines of 1,350 tons' weight working up to about 9,000 Indicated H.P., and there would be about 200 tons to spare for cargo and coal; which power may be expected to propel the vessel at the maximum speed of 25 statute miles per hour, or the proposed average postal speed of 22½ statute miles, and the cost of the vessel, on the same data as before calculated on, would probably not exceed £156,500, being within the limit proposed to Parliament as the probable cost of one vessel capable of fulfilling the proposed postal requirement of 22½ statute miles per hour on the 64 mile passage referred to. he (Mr. A.), therefore, regarded this project as mechanically practicable, inasmuch as the consumption of fuel on *so short a passage*, namely, 3 hours, does not materially affect the calculation.

On project, No. 2, namely, the performance of a passage of 3,250 nautical miles in 6 days, or, at the continuous speed of 22 nautical or $25\frac{3}{10}$ statute miles an hour, Mr. ATHERTON again referred to the Series of Tables which he has constructed on the data of *existing practice* before referred to, irrespective of hitherto *not realised mechanical improvements*, showing the progressively increasing size of vessel that would be required to perform a passage of 3,250 nautical miles at different rates of speed progressively increasing from 10 nautical miles per hour up to the proposed speed of 22 nautical miles per hour; from which it appears that a vessel of 2,500 tons' Mean Displacement, or 2,750 tons' Deep-draught Displacement, propelled by engines working up to 852 Indicated H.P., may be expected to attain the speed of 10 nautical miles

per hour, and, therefore, to perform a passage of 3,250 nautical miles in 13 days, and have available Displacement for about 1,000 tons' weight of cargo; but that, to perform the passage of 3,250 nautical miles at the accelerated speed of 22 nautical miles per hour, as required for the proposed 6 days' passage, it would, *on the data of present practice*, require a ship of 60,000 tons' Deep-draught Displacement, propelled by engines working up to 66,904 Indicated H.P., to perform the proposed service, even though the course of the vessel should always be favoured with a *non-obstructive* wind or current, and the Displacement available for cargo would be about 3,000 tons only.

Mr. ATHERTON noticed, that for high speed and long passages such as this (if a passage of 3,250 nautical miles can now-a-days be called long), engine improvement as to lightness may not be so available as for short passages of only 2 or 3 hours' duration; and, moreover, that the advantage of such reduction of engine-weight per H.P. gradually becomes less appreciable in proportion to the length of passage without re-coaling, unless the *consumption of fuel per H.P.* be also in like manner reduced, of which he (Mr. A.) is not aware of any existing example below the consumption of 4½ lbs. per Indicated H.P. per hour as herein calculated upon. He, therefore, regards this project for performing a passage of 3,250 nautical miles in 6 days as involving the Mercantile question of investing about £1,500,000 in the equipment of a single vessel, but he does not know whether such an investment has been contemplated by the promoters of the scheme.

On project, No. 3, namely, the performance of a voyage from England to Calcutta and BACK at the *average speed of* 15 *nautical miles an hour, carrying coal for the whole voyage of about* 25,000 *nautical miles*, Mr. ATHERTON observed, that after the elucidation elicited on the previous question as to the passage of 3,250 miles at 22 miles an hour, requiring a ship of 60,000 tons' Displacement, he would commence the investigation of this project for steaming 25,000 nautical miles at the average speed of 15 nautical miles per hour, without re-coaling, by examining whether a vessel even of 100,000 tons' Displacement (being about 20 times the capacity for Displacement of H. M. steam-frigate AGAMEMNON) would, *on the data of existing practice as before referred to*, fulfil the requirements of the proposed project, and he came to the conclusion that a steam-vessel of this size might perform the voyage of 25,000 miles, without re-coaling, at the reduced average speed of 14 nautical miles per hour, but the Displacement for cargo would be inappreciable. The engine-power required even for this reduced speed of 14 nautical miles per hour would be 27,532 Indicated H.P., the consumption of fuel would be nearly 1,400 tons per day, and the cost of the ship and engines would probably amount to two millions; that is, if the ordinary averages of calculated expenditure admit of being approximately applied to so unprecedented a hypothesis.

Presuming, therefore, that this project of carrying coal from England to Calcutta *in a sufficiently surplus quantity to bring the ship back again at the*

average rate of 15 *nautical miles an hour on the whole voyage of* 25,000 nautical miles would not bear the test of Mercantile investigation as respects its *economy*, for which object the scheme of taking coal from England for the whole voyage out and home has been proposed; Mr. ATHERTON proceeded to observe that if the distance, without re-coaling, were reduced to 12,500 *nautical miles*, by re-coaling at Calcutta for the home passage, then a ship of 25,000 tons' Mean Displacement, with a Deep-draught Displacement of 37,000 tons, might (wind and current excepted) perform the passage of 12,500 nautical miles at the speed of 15 nautical miles per hour, but the Displacement available for goods and cargo would, *as regards weight*, be inappreciable; the vessel, presuming it to be constructed on a type *not inferior* to that of RATTLER before referred to, would require about 13,400 Indicated H.P., and the cost would probably amount to £600,000. Still, however, it may be expected that though the ship may be capable of a *maximum* speed of 15 nautical miles per hour, the influence of wind and weather would reduce the *average* speed to about 15 statute miles, or 13 nautical miles, per hour, which reduction of speed together with re-coaling at Calcutta altogether alters the conditions of the problem as set forth in the original prospectus of the project under consideration.

In conclusion, Mr. ATHERTON deprecated the idea of involving Commercial Investments in projects, the conditions of which may not be capable of being substantiated, and, as on this principle he conceived that every project *should stand or fall by the terms of the* PROSPECTUS *whereby it may have been brought before the Public*, he considered it unnecessary to prosecute the enquiry as to the extent to which the project of steaming 25,000 nautical miles *at the average speed of* 15 *nautical miles an hour without re-coaling* must be modified before it would be reduced to a condition of Mercantile feasibility.*

* *The foregoing summary of the remarks expressed by Mr. Atherton at the Meeting on the* 15*th November was, at the request of the Secretary, handed in by Mr. A. on the* 18*th November. The discussion on Ocean Steamers was again brought forward at the ensuing Meeting, on the* 22*nd November, subsequently to which Meeting, the private press report of proceedings was issued; the subject was again notified for further discussion on the* 29*th November, when Mr. Atherton attended and* PROTESTED *against the record on this discussion, as promulgated by the* PRIVATE PRESS REPORTS *thereof, but Mr. A. was not permitted to vindicate his disputed statements, as recorded by him on the* 18*th, nor was any notice taken in the subsequent private press report of the protest thus entered by Mr. A. in regard thereto, consequently, Mr. Atherton addressed the following Letter and Memorial to the President and Council of the Institution:—*

TO THE SECRETARY OF THE INSTITUTION OF CIVIL ENGINEERS.

Woolwich Dockyard,
17th December, 1853.

My Dear Sir,

The private press reports of the proceedings of the Institution of Civil Engineers on "the proposed large class of Steamers" having been promulgated without any notice being taken of the PROTEST made by me at the Meeting on the 29th November in regard to the records on this discussion, I beg to forward herewith a MEMORIAL on the subject of the proceedings referred to, requesting that you will be pleased to hand it to the Council at their first meeting. I also beg to claim the privilege, to which I believe I am entitled, of having this Memorial duly submitted to a Meeting of the Institution, and *literally* recorded; observing, also, that as the subject of this discussion has been publicly promulgated by the private press in a way that I conceive to be incorrect and professionally prejudicial to myself, I purpose giving publicity, should occasion so require, to these and to any other remarks I may have to make on the subject referred to.

I remain, my dear Sir,

Yours truly,

CHARLES ATHERTON.

MEMORIAL

BY

CHARLES ATHERTON

TO

THE PRESIDENT AND COUNCIL AND MEMBERS

OF THE

INSTITUTION OF CIVIL ENGINEERS.

Woolwich Dockyard,
17th December, 1853.

GENTLEMEN,

The Institution of Civil Engineers, at their meeting on the 8th November last, were pleased to take up the subject of a paper presented to the Institution by Captain Andrew Henderson (Hon. East India Company's Service), "On the Speed and other properties of Ocean Steamers, and on the Measurement of Ships for Tonnage;" in the discussion on that subject it was remarked by a Member of the Institution that, in proposing any new system of measurement, it is desirable that the *especial object* in view should be expressly stated. Concurring, as I cordially did, in the foregoing remark, I brought before the notice of the meeting, that if a complete scale of Displacement were regularly supplied by Ship Builders, or taken by official authority, it would afford an elementary datum of primary importance for judging of the comparative locomotive properties of different types or forms of Ship, whereby the relative degrees of *scientific talent* displayed in the construction of Steam Ships in a dynamical point of view might, on trial of the vessels' speed and power, be approximately ascertained, a RIVALRY OF TALENT would thus be created conducive to scientific progress in Steam Navigation similar to what has occurred in Railway Engineering, producing Mercantile results which would, in my opinion, be highly advantageous to the public interests. I now beg to observe that *no notice* was taken of these remarks in the *private press report* of proceedings on the 8th November, which, under

the auspices and control of the President and Council, is printed and circulated weekly for the information of the Members of the Institution.

Subsequently to the meeting on the 8th November above referred to, the President and Council were pleased, by their Circular Letter of the 9th November, to suggest that the attention of Members, at their ensuing meeting on the 15th November, might be especially directed to "The advantages and disadvantages of the PROPOSED LARGE CLASS OF STEAMERS, with respect to their scientific construction, their capabilities for navigation, and their commercial economy;" accordingly, at the meeting of the Institution on the 15th, I submitted my views on the subject thus especially proposed and put forward by the President and Council themselves for discussion, particularly specifying the projects to which I presumed that the requisition had reference, and to which my remarks and calculations applied. The usual weekly private press report of this day's proceedings was not issued, (thus the statements made by me on the 15th were suppressed,) but the subject was again discussed at the subsequent meeting on the 22nd, and again notified for further discussion on the 29th. On the 29th, therefore, I attended for the purpose of responding to remarks which had been circulated by the private press report of proceedings on the 22nd, calling in question the authenticity of the suppressed statements made by me on the 15th, the President, however, on his taking the chair on the 29th November, instead of continuing the discussion "on the large class of steamers," as notified by the circular, summarily announced the discussion on this part of the subject closed; whereupon, I PROTESTED AGAINST THE PARTIAL RECORDS OF PROCEEDINGS AS PRINTED AT THE PRIVATE PRESS AND ISSUED TO THE MEMBERS OF THE INSTITUTION; basing my protest on the following grounds, viz.—

That the purport of the remarks submitted by myself to the meeting on the 8th November had been entirely excluded from the private press report; also, that the usual weekly private press report of the proceedings on the 15th November had not been issued at all previously to the meeting of the 22nd, and that, in consequence of such suppression of my statements, misapprehensions had arisen at the meeting on the 22nd of November as regards the facts to which I had referred, as well as in regard to the limitations on which I had based my calculations, and also as respects the sense that pervaded my sentiments on the subject of the proposed large class of steamers especially referred to; on all which points I expressed my desire to offer full explanation, but I was prevented from so doing on the grounds that the discussion had now been closed, as before stated, from the chair. In consideration, however, of the urgency with which I claimed to be heard, the President was pleased so far to accede to my request as to concede that I should, under the circumstances referred to, be permitted to read the written statement that, at the request of the Secretary to the Institution, I had myself drawn up and handed to him on the 15th November, as being the purport of the remarks expressed by me at the

previous meeting on the 15th November, in order that a summary thereof might appear as usual in the private press weekly report to be issued previously to the 22nd; such, indeed, having been the very purpose for which, at the request of the Secretary to the Institution, I had prepared and delivered the statement which was, nevertheless, suppressed. Now, inasmuch as this subject has been brought to a close by the decision of the President and Council without having been by any means exhausted on the part of the Members of the Institution, and closed under PROTEST on my part as to the private press reports, of which PROTEST, or of the grounds thereof, *no notice whatever has been taken in the private press reports of proceedings on the 29th November*, I now beg to present, in the form of a MEMORIAL for record at the Institution, and to be otherwise used as the case may require, the explanation which I was prepared to bring before the Institution at their meeting on the 29th November in justification of my previous statements of the 15th November, which, though suppressed, had, nevertheless, been called in question by the subsequent private press report of proceedings on the 22nd.

In the first place,—I beg to explain that, individually, I have taken up this subject purely as a mechanical question of steam-ship constructive efficiency in a *dynamical* point of view. I have not touched the question as regards the Mercantile, or the Statistical, or the Nautical considerations, which, in their respective departments, may bear powerfully on the case; and, as an Engineer, I have limited my estimate of "Stock Cost" merely to the probable investment that would, in my opinion, be incurred in the fitting out of a single ship, if constructed of dimensions *capable of fulfilling the required conditions*, of the project as set forth by its prospectus.

The statements and calculations submitted by me to the Institution on the 15th November were avowedly based on the type and form of H. M. screw steam-sloop RATTLER, the locomotive efficiency of which vessel, when tested by the formula $\frac{V^3 D^{\frac{2}{3}}}{\text{IND. H.P.}}$, was referred to as being, to the best of my knowledge, unsurpassed by that of any vessel of the present day, either in the Royal Navy or in the Merchant Service; and the data on which my calculations were made were particularly set forth and referred to. Nevertheless, by the weekly private press report of proceedings of the Institution on the 22nd November, page 4, it is set forth, in reference to the suppressed statements which I made on the 15th, that "*the data were not given for selecting that vessel*," and also, "that the RATTLER had not performed a series of long voyages under every variable line of immersion, or under such changes of weather and states of the sea as to furnish data for such important deductions;" and again, by the private press report of proceedings on the 29th November, page 3, it is set forth that "it must be clearly understood that the RATTLER, which had been used as the type, was built during the most depressed period (scientifically) of construction in H. M. Dockyards."

Now, as regards having based my calculations on the type of *form* exemplified by H. M. steam-sloop RATTLER, the reasons for my selection of that vessel were fully referred to in my statement of the 15th, and may be re-stated and further extended as follows :—

1st. Because, on referring to the published Admiralty record of the test-trials of the screw ships of the Royal Navy, as printed and issued by the Admiralty in May, 1850, (in which record the locomotive performance or efficiency of each ship has been designated by a numeral co-efficient, or index number of efficiency, deduced from the formula $\frac{V^3 D_{\frac{2}{3}}^2}{IND.\ H.P.}$) I found that H. M. steam-sloop RATTLER *stood at the head of the list* as surpassing all screw ships then in the Royal Navy.

2nd. Because, having recently availed myself of opportunities for comparing by the same rule, H. M. steam-sloop RATTLER with other vessels, both paddle-wheel and screw, in the Merchant Service as well as in the Royal Navy, including H. M. steam-packet BANSHEE (paddle-wheel), still I have never yet met with any vessel that, on combination of the elements of DISPLACEMENT, POWER, and SPEED, *by the rule referred to*, has produced a numeral result indicative of a superior degree of locomotive efficiency to that attained by RATTLER.

3rd. Because, amongst all the *newspaper* and other published reports of data derived from steam-ship trials, I have never seen any instance based on complete and duly authenticated trial, whereby it can be deduced by the rule or formula referred to that the locomotive efficiency of the RATTLER has, hitherto, been surpassed.

4th. Because, H. M. steam-sloop RATTLER, after 10 years' service in the Royal Navy, *chiefly on Foreign Service in all seas*, and subject to all the usual fluctuations in point of immersion, has proved herself to be a vessel of creditable sea-worthy properties for her class, thereby showing that the high degree of locomotive efficiency exemplified by the type of RATTLER has not been attained by the sacrifice of nautical trustworthiness.

5th. Because, H. M. steam-sloop RATTLER having been the first vessel exceeding a Displacement of 1000 tons to which the screw propeller was applied in the Royal Navy, and the precursor to the application of the screw to vessels of large size in the Merchant Service, I regarded it as an important subject for investigation why this ship, *although not originally constructed for a screw-vessel*, but converted in the year 1841 to a screw ship by a slight addition to her stern, should still, *in the year* 1853, appear at the head of the published lists of *steam-vessels* in regard to locomotive efficiency, as determined by the formula above referred to, based on *actual trial data* duly authenticated.

6th. Because, the peculiarities of this case of RATTLER, though brought before public notice by the published records of the Admiralty in May, 1850, (which record has been re-published, for example, by BOURNE,) and especially referred to by myself in an Essay on MARINE ENGINE CONSTRUCTION, page 12, published by WEALE, London, in April, 1851, and again referred to by me in an Essay on STEAM SHIP CAPABILITY, page 18, published by GRANT, Woolwich, in March, 1853; of both which Essays I have presented copies to the Institution and distributed them extensively amongst Naval Officers and steam-ship constructors, still, notwithstanding this publicity, the superiority of RATTLER has remained unchallenged, excepting by the general assumptions published in the *private press* report of proceedings at the Institution on the 22nd November, to which all reply on my part at the Institution of Engineers, even in justification of my statements, has been denied me and foreclosed.

7th. Because, the type of RATTLER, although described by the private press report of the Institution as having been "*built during the most depressed period, scientifically, of construction in H.M. Dockyards,*" is nevertheless so far tacitly acknowledged to be remarkable, that certain eminent constructors of the present day have, as I understand, declined to guarantee, *under contract*, the re-production of equal dynamic results, on the test of the formula referred to.

8th. Because, I regard it as a reasonable requirement that all contracts for steam-ships should include *some guarantee or other*, not only as to the size but also as to the DYNAMIC QUALITY of the steam-ship to be delivered under the contract, and for which, gold of a certain *weight* and standard QUALITY is to be paid. I believe that one mode of effecting the object of *contract guarantee* as to the dynamic *quality* of Merchant steam-ships would be approximately attained by means of the co-efficient or index number deduced by the formula $\frac{V^3 D^{\frac{2}{3}}}{\text{IND. H.P.}}$, from data derived from the actual test-trial performance of the vessel, and although H. M. screw steam-sloop RATTLER was constructed in "1841," when, as would appear by the private press report of the proceedings of the Institution, "*H. M. Dockyards were, scientifically, in their most depressed condition,*" nevertheless, I believe it will be found that the co-efficient or index number indicative of the dynamic quality of that vessel is still the highest that any steam-ship constructor would now in "1853," be willing to admit *as the base of a steam-ship contract.*

9th. Because, the adoption of some guarantee such as that above suggested would, by affording the means of comparing the "dynamic *qualities*" of steam-ships, at once lead to *professional rivalry* that would greatly promote the science of steam-ship construction and be conducive both to Naval efficiency and Mercantile economy of transport: considerations of high public importance.

Such are the grounds on which I assumed the TYPE of RATTLER as the base of my calculations, and it will be a subject of Mercantile congratulation when steam-ship constructors shall not merely achieve an occasional superior dynamic result, but constantly guarantee its equal. Investigations and calculations such as I have advanced required, as an assurance of their practical application, to be based on *some existing type of form*, and, for the reasons above stated, it appeared to me that the RATTLER, though constructed in "1841," still afforded in 1853 the most appropriate type of form on which I could base calculations on steam-ship cabability according to an *already realised* and, as may be hoped, again realisable scale of performance. The sentiments with which I have regarded and still regard the case of the RATTLER are set forth at page 18 of my Essay on *Steam Ship Capability* (published by GRANT, Woolwich, 1853,) in the following terms :—"Her Majesty's steam-sloop RATTLER having now held this pre-eminent position for 12 years, it is, of course, to be expected that, amongst the multiplicity of rivals of modern construction and the confident pretensions to superiority advanced successively in favour of each ship of the most recent build, the RATTLER must soon assume a secondary place : until, however, such superiority shall be realised, the RATTLER may be regarded as a *type of form* and of engine adaptation thereto worthy of the study (not slavish imitation) of steam-ship CONSTRUCTORS and the attention of steam-ship PROPRIETORS."

Now, as respects the "PROPOSED LARGE CLASS OF STEAMERS" to which the attention of members was directed by the Circular of the President and Council, and to which I addressed myself at the meeting on the 15th November, I considered it indispensable that I should specify "*the particular projects*" which I presumed to be specially referred to as the subject of discussion, namely :—

1st. The project favourably noticed by a Committee of the House of Commons for effecting the passage between Holyhead and Kingstown (a distance of 64 statute miles) at a postal speed of 22½ statute miles per hour.

2nd. The project now said to be undertaken by American constructors to establish a communication between New York and Liverpool in 6 days, the length of passage being assumed at 3,250 nautical miles, and therefore demanding an average speed of 22 nautical miles per hour.

3rd. The project said to be undertaken in London for establishing a steam-ship communication between England and Calcutta by vessels to be *capable of carrying sufficient fuel for the whole voyage to* CALCUTTA AND BACK, being a voyage of about 25,000 nautical miles, *without re-coaling*, at the promised average speed of 15 *nautical miles an hour*.

No objection, be it observed, was taken by the President and Council at the meeting on the 15th to the foregoing specific designation of projects

which I thus particularized as being THE PROJECTS to which I presumed that the Circular of the President and Council referred. The first two projects, though the subjects of the chief portion of the statements addressed by me to the meeting on the 15th November, have not been noticed at all by subsequent speakers or in the private press report of proceedings, and, therefore, I make no further allusion to them ; but, as regards the 3rd project, namely, the projected voyage of 25,000 nautical miles, *without re-coaling*, at the average speed of 15 nautical miles per hour, as proposed by the EASTERN STEAM NAVIGATION COMPANY, the private press report has altogether mis-stated the obligatory conditions announced by the PROSPECTUS of this project by referring to them in the following terms:—

"It was assumed that when it was stated a large steamer was intended to run to India or Australia and back, without re-coaling, it was only meant that she would carry enough coal to avoid detention at the *intermediate* ports."

By this assumption, the correctness of my statements as to the published conditions of the prospectus of the Eastern Steam Navigation Company has thus, on the face of the Institution PRIVATE PRESS report, been directly questioned, and my proferred vindication thereof having been refused, it now only remains for me to justify my statements by quoting the printed prospectus of the Eastern Steam Navigation Company as promulgated and presented at a general meeting of the Proprietors, August 6th, 1853, from which I extract the following announcements :—

PAGE 3.—"Your ships will *escape the great* COST *of taking in coal* AT A FOREIGN STATION: your ships will take their *whole amount of coal for the voyage* FROM NEAR THE PIT'S MOUTH *at a rate not exceeding, for the best quality, 12s. to 14s. per ton.*"

PAGE 4.—"By this great speed (15 knots an hour) the voyage between ENGLAND and INDIA, by the Cape, will be reduced to from 30 to 33 days, and between ENGLAND and AUSTRALIA to 33 or 36 days."

PAGE 7.—"Your Directors think it right to state that the result of their calculations is, that after making the most ample allowance for working expenses, depreciation, wear and tear, and insurance, a surplus remains equal to 40 per cent. per annum upon the capital invested."

Such are the terms of the prospectus on which I made the statement that the ships for this project were to be coaled in ENGLAND for the whole voyage to CALCUTTA AND BACK, direct, and that the vessels were to be propelled at the average speed of 15 nautical miles per hour; and it is now important to observe that the mechanical capability of the proposed ships to carry coal

FOR THE WHOLE VOYAGE at the average speed of 15 nautical miles per hour, to be shipped from "*near the pit's mouth at a cost not exceeding* 12*s. to* 14*s. per ton for the best quality,*" was prominently put forward in the prospectus as one of the ostensible grounds of economy in the great item of coal on which the *promised dividend of* 40 *per cent. per annum* was held out to the Shareholders. It is the mechanical fulfilment of these conditions, on which the said promised dividend of 40 per cent. per annum has been calculated, that constitutes the question which I undertook to discuss on the base of *existing steam-ship practice,* irrespective of promissory improvements not yet practically realised.

I conceive that I need not now, in this Memorial, recapitulate the statements and calculations made by me at the meeting of the 15th on the subject of this project: suffice it to say that, assuming the index number of the RATTLER as the base of my calculations, and taking the consumption of fuel at $4\frac{1}{2}$ lbs. per indicated H.P. per hour, (which, I believe has not been surpassed by the best examples of marine engine practice of the present day,) I came to the conclusion that the size of vessel that would be required for the due fulfilment of the CONDITIONS of the project, *as announced by the* PROSPECTUS of the Eastern Steam Navigation Company, would, probably, be not less than 100,000 tons' Displacement! and that the whole CAPITAL of the Company, as proposed by the prospectus, namely, £2,000,000, would, probably, be absorbed in the construction of a *single vessel, if constructed of the stupendous size that would, according to my calculations, be indispensable for the performance of* 25,000 *nautical miles without re-coaling, at the average speed of* 15 *nautical miles per hour.* A written summary of the remarks expressed by me at the meeting on the 15th November setting forth the data and grounds of my calculations was, as before stated, prepared by me at the express desire of the Secretary of the Institution, and handed to him by myself on the 18th November; and it is to the total suppression of that written document expressive of my sentiments, whilst the sentiments of others having apparently a more favourably tendency in support of the project referred to, and questioning my veracity in order to support that view, have been circulated by the PRIVATE PRESS of the Institution, that I attribute much of the misunderstanding and perversion that has arisen in regard to my opinions as to the undoubtedly superior dynamic capability of large ships as compared with smaller vessels.

As an Engineer, I am not opposed to the construction of large ships, as has been erroneously imputed to me, but I have questioned the fulfilment of the MECHANICAL CONDITIONS as respects the *combination* of a 15 knot speed with a 25,000 mile voyage WITHOUT RE-COALING, on which this EASTERN STEAM NAVIGATION PROJECT appears to have been founded.

My sentiments as to the advantages of large ships in a mechanical point of view have been fully set forth in my engineering practice, as the constructor of the engines of the "DON JUAN," in "1834," the largest engines of their day, and in the publication that I have issued on Steam Ship Capability, in 1853 I have thus both practically and theoretically declared myself in favour of the

superior capabilities of large ships as respects either SPEED or DISTANCE, but I desire to forewarn steam-ship proprietors of the Mercantile disappointment to which extravagant expectations as respects the *combination* of high speed and great length of voyage, WITHOUT RE-COALING, by the mere agency of size, will, in my opinion, inevitably lead. Constructively, I recognise no limit as to size but that which may be dictated by MERCANTILE and NAUTICAL considerations; and I believe that my views, as stated by myself, have been expressed in a manner that would not have been misunderstood, had they not been promulgated in a perverted sense by the PRIVATE PRESS REPORTS of the Institution of Engineers.

CHARLES ATHERTON.

FURTHER REMARKS.

(Not included in the foregoing MEMORIAL *to the Institution of Engineers.)*

Mr. ATHERTON avails himself of this opportunity to elucidate more fully the views which he entertains in demonstration of the superior dynamic capabilities of large ships, and which he was desirous to bring before the Institution of Engineers at their meeting on the 29th November last, had further remark on his part been permitted. Continuing, therefore, our investigations, the following Tables (based on the formula $\frac{V^3 D^{\frac{2}{3}}}{\text{IND. H.P.}} = C$) will show definitely the comparative degrees of superior capability which, in a locomotive or dynamical point of view, and without reference to Mercantile or Nautical considerations, is the inherent property of increased magnitude; the comparison being made between ships of *similar* type of form, but differing only in *size*: the type now, as before, adopted as the base of the calculations being that of "RATTLER," of which vessel, the co-efficient (C) deduced, with reference to the Indicated H.P. of 33,000 lbs. raised 1 foot per minute, is C = 215·5.

TABLE, No. 1, showing the SUPERIOR CAPABILITY of large ships, as indicated by a *progressively increasing rate of speed* corresponding to a progressively increasing size of ship; the proportion of Displacement to Power being assumed, in all cases, constant, namely, 2 tons' weight of Displacement to 1 Indicated H.P., of 33,000 lbs., raised 1 foot per minute:

Displacement. Tons.	Indicated H.P.	Speed. Knots.
5000	2500	12·27
10000	5000	13·25
20000	10000	14·31

Hence, it appears that the same PROPORTION *of Power to Displacement which drives a ship of 5,000 tons Displacement at 12 knots an hour will drive a ship of 10,000 tons, on the same type of build, at 13 knots, and a ship of 20,000 tons at 14 knots per hour.*

TABLE, *No. 2, showing the* SUPERIOR CAPABILITY of large ships as indicated by the *progressively reduced ratio of Power to Displacement*, whereby a *constant speed* is given to vessels of progressively increasing size; the calculation being made for the constant speed of 15 nautical miles an hour:

Displacement. Tons.	Speed. Knots.	Indicated H.P.	Ratio of Displacement to Indicated H.P.
5000	15	4569	100 to 91
10000	15	7252	100 to 72
20000	15	11513	100 to 57

Hence, it appears that to attain the speed of 15 knots an hour, a ship of 5,000 tons' Displacement requires 91 Indicated H.P. for each 100 tons' of Displacement; but a ship of 10,000 tons' Displacement, on the same type of build, requires 72 Indicated H.P. for each 100 tons' Displacement, and a ship of 20,000 tons on the same type of build will require only 57 Indicated H.P. for each ton of Displacement.

TABLE, No. 3, showing the SUPERIOR CAPABILITY of large ships as indicated by the *progressively increasing distance* capable of being run, without re-coaling, at a given rate of speed (say 15 knots an hour,) and with a given per centage of the Displacement appropriated to cargo (say 10 per cent)—see note:

Mid Passage Displacement. Tons.	Speed. Knots.	Indicated H.P.	Cargo (10 per cent. of Displacement). Tons.	Coal. Tons.	Distance, without re-coaling. Naut. Miles.
5000	15	4569	500	2716	4440
10000	15	7252	1000	6374	6555
20000	15	11513	2000	14244	9240

Hence, it appears that, at the speed of 15 knots an hour, and with 10 per cent. of the Displacement appropriated to Cargo, a ship of 5000 tons' Displacement will steam a distance of only 4,440 miles without re-coaling; but a ship of 10,000 tons, will under the same conditions, steam 6,555 miles without re-coaling, and a ship of 20,000 tons, will, under the same conditions, steam 9,240 miles without re-coaling, at the speed of 15 knots per hour.

NOTE.—In these Tables the weight of the hull and its equipment is assumed to be 40 per cent. of the Mid Passage Displacement; the weight of the engines and their equipment 3 cwts. per Indicated H.P., and the consumption of coal 4½ lbs. per Indicated H.P. per hour.

TABLE No. 4, showing the SUPERIOR CAPABILITY of large ships as indicated by the *reduced consumption of fuel per ton of cargo* at which goods will be conveyed a given distance, without re-coaling, at a given speed; supposing, for example, that the distance, without re-coaling, is to be 3,250 nautical miles and the speed 10 nautical miles an hour:

Mid Passage Displacement. Tons.	Speed. Knots an hour	Indicated H.P.	Distance Naut. Miles.	Coal. Tons.	Cargo. Tons.	Tons of Coal per Ton of Cargo.	Deep-draught Displacement. Tons.
5000	10	1354	3250	884	2219	·40	5442
10000	10	2149	3250	1403	4762	·29	10701
20000	10	3411	3250	2227	10034	·22	21113

Hence, it appears that, in the case of a 3,250 *miles direct passage at* 10 *knots an hour, by increasing the size of the ship from* 5,442 *tons to* 21,113 *tons of Deep-draught Displacement, the consumption of coal* per ton of cargo conveyed *is reduced from* $\frac{40}{100}$ *down to* $\frac{22}{100}$ *being a reduction of nearly* 50 *per cent. in favour of the larger ship.*

The foregoing Tables having thus illustrated the SUPERIOR CAPABILITIES of large ships as compared with smaller vessels for the performance of any special service *under the same specific conditions of speed and distance without re-coaling*, the following TABLE (No. 5) is intended to show how soon the admitted advantages which result from increased size become neutralized, if, *on the strength of increased size alone*, we undertake OBLIGATIONS which involve, on the part of the large ship, *an increased rate of speed* COMBINED *with an increased distance, without re-coaling*; to demonstrate which, we will assume that in the prosecution of a steam-ship project on a line of communication extending a distance of about 12,500 nautical miles (such, for example, as the line between England and Calcutta), it is intended to employ shipping to the extent of about 20,000 tons, to be propelled by steam-power in the proportion of 2 tons of Displacement to 1 Indicated H.P. The problem now is to determine whether, as respects SPEED and the consumption of COAL per ton weight of CARGO conveyed, the proposed service will be most advantageously performed by

SCHEME No. 1.

ONE VESSEL of 20,000 tons Mean or *Mid Passage* Displacement and 10,000 Indicated H.P., making the passage of 12,500 nautical miles direct, at the speed of 14·31 nautical miles an hour; or by

SCHEME No. 2.

TWO VESSELS of 10,000 tons' Mean or *Mid Passage* Displacement and 5,000 Indicated H.P., making the passage in 2 stages of 6,250 nautical miles, at the speed of 13·25 nautical miles an hour; or by

SCHEME No. 3.

FOUR VESSELS of 5,000 tons' Mean or *Mid Passage* Displacement and 2,500 Indicated H.P., making the passage in 4 stages of 3,250 nautical miles, at the speed of 12·27 nautical miles an hour.

It will be found by calculations *based on the data before referred to*, that the mutual relations of Displacement, Power, Speed, Length of Passage, Cargo, and Coals, which result respectively from the above-mentioned 3 Schemes of shipping, will be as represented by the following TABLE, No. 5 :—

Scheme.	Mean or Mid Passage Displacement.	Indicated H.P.	Speed per hour.	Distance 12500 Nautical Miles.	Steaming time.	Coal.	Cargo.	Coal per ton of Cargo.	Deep Displacement.
	TONS.		N. M.	1 stage of	D. H.	TONS.	TONS.	TONS	TONS.
1	20000	10000	14·31	12500	36·10	17550	725	24	28775
				2 stages of					
2	10000	5000	13·25	6250	39· 8	9478	2381	4	12369
				4 stages of					
3	5000	2500	12·27	3250	44· 3	5316	1711	3	5664

From the above Table we observe the following results, namely :—

The steaming speeds by the above proposed 3 Schemes respectively will be at the rate of about 14, 13, and 12 nautical miles per hour : the steaming time at sea on the passage of 12,500 miles will be about 36, 39, and 44 days by the 3 Schemes respectively, and allowing 4 days for re-coaling the 10,000 tons' ship (Scheme No. 2) at the one intermediate station, and 2 days for re-coaling the 5,000 tons' ship (Scheme No. 3) at each of the three intermediate stations : then the whole time of passage between England and Calcutta by the 3 Schemes respectively would be 36 days, 43 days, and 50 days ; being 14 days shorter time of passage in favour of the one ship (Scheme No. 1) as compared with the 4 ships (Scheme No. 3) ; but the Mercantile sacrifice which attends this saving of 14 days by Scheme No. 1, as compared with Scheme No. 3, is, that by scheme No. 1, 17,550 tons of coal are consumed in the conveyance of only 725 tons of cargo, being at the rate of 24 tons of coal per ton of cargo, while each of the 4 ships of Scheme No. 3 consumes 5,316 tons of coal in the conveyance of 1,711 tons of cargo, being at the rate of 3 tons of coal per ton of cargo. Thus, notwithstanding the superior capabilities of large ships as compared with smaller vessels for performing any special service *on equal conditions* in regard to speed *and* distance without re-coaling (as shown by Tables 1, 2, 3, and 4,) we see, in *the case before us* (as shown by Table No. 5,) assuming each ship to make the

some number of passages per annum (for, the larger ships, though a shorter time at sea, will be detained the longer in port,) that the four ship Scheme, No. 3, as compared with the one ship Scheme, No. 1, is, under the different conditions as to speed and coaling stations above stated, capable of transporting between England and Calcutta nearly 10 times the aggregate weight of cargo per annum with one-eighth of the consumption of coal per ton of cargo conveyed, but with an admitted sacrifice of 14 days on the time of passage.

If, however, the consumption of fuel on board of ship be reduced from 4½lbs, per Indicated H.P. per hour, on which the foregoing calculations have been based, down to 3lbs. per Indicated H.P. per hour, which is theoretically possible, and, therefore, it is hoped, may be achieved, then, on the same principle of calculation and under the above stated conditions as to loss of time by Scheme No. 3, it would still be found that the four ship Scheme, No. 3, as compared with the one ship Scheme, No. 1, would transport about double the weight of cargo per annum between England and Calcutta with about one-half of the consumption of fuel per ton of cargo conveyed, but, as before stated, with an admitted sacrifice of 14 days on the time of passage.

The consumption of fuel per ton of cargo conveyed is, as one item of expense, perhaps the best criterion of the relative merits of different Schemes of Steam Navigation as respects Mercantile economy; and, on inspecting Table No. 5 with reference to this point, it will be observed that the 2nd and 3rd Schemes are very nearly on a par with each other, that is, under the assumed working arrangements of these Schemes as above set forth, a vessel of 5,664 tons Deep-draught Displacement fitted for steaming at 12 knots per hour, and re-coaling at intervals of 3,250 nautical miles, will be somewhat more economical than a vessel of 12,369 tons Deep-draught Displacement fitted for steaming at 13 knots per hour, and re-coaling at intervals of 6,250 nautical miles, and as compared with a vessel of 28,775 tons Deep-draught Displacement fitted for steaming at 14 knots per hour, and making the passage of 12,500 miles direct, without re-coaling at any intermediate station, the difference in point of freight economy, as indicated by the economy of coal per ton of cargo conveyed, is so greatly in favour of the smaller vessel, *time excepted*, that a vessel working under such conditions of 14 *knot speed* COMBINED *with a* 12,500 *mile distance, without re-coaling*, can only be regarded as a packet not profitably available for Mercantile cargo.

If, however, the ship for Scheme No. 1 be constructed for a Deep-draught Displacement of 26,000 tons, and be fitted for the *reduced* speed of 12 knots per hour, the direct passage of 12,500 miles would then occupy 44 days, the consumption of fuel at 3lbs. per Indicated H. P. per hour would be 12,000 tons, and the Displacement available for cargo would be 4000 tons weight, being at the rate of 3 tons of coal per ton of cargo conveyed, or about the same expenditure of coal per ton of cargo as that incurred by the 5,664 tons ship, (Scheme No. 3) steaming at the same speed, viz., 12 knots per hour, but

re-coaling at intervals of 3,250 nautical miles, and taking, including stoppages for re-coaling, 50 days for the passage; being an admitted superiority of 6 days in favour of the direct passage of the Leviathan ship of 26,000 tons. The question is, whether this result, viz., the saving of 6 days by the Leviathan ship, will adequately compensate for the extraordinary requirements of its realization.

In all the foregoing statements, the mutual relations of *Displacement*, *Power*, and *Speed* have been calculated without reference to the influence of wind and current, which, indeed, may be regarded as obstructing the regular performance of a high speed service; for, a favourable wind, such as might help a vessel steaming at 12 knots an hour (as in Scheme No. 3), may afford no aid or even oppose a vessel steaming at 14 knots an hour (as in Scheme No. 1); and an adverse wind will obstruct a vessel steaming at a high speed in a greater ratio than it would obstruct the low speed ship.

On these grounds, Mr. A. would again affirm the remark advanced in his Essay on *Steam Ship Capability*,* page 60, as follows:—

"It is presumed to have been sufficiently shown by the foregoing calculations and deductions therefrom (though avowedly based on approximate data), that extreme caution ought to attend all Mercantile steam-ship contracts in regard to the obligation of maintaining such a rate of STEAMING SPEED for a *long passage* as exceeds the rate at which the wind may be expected to partially co-operate with the steam power; it is also presumed to have been shown how greatly it is to be apprehended that various projects now publicly promulgated, and confidently professing to undertake the regular performance of very long passages at high rates of speed (for instance, 15 knots an hour and upwards), are based on expectations not commercially justified by the relation which, at present, actually subsists between Steam-ship Displacement, Power, Speed, and COST of freight *per ton*; at least, if the probability of the due fulfilment of such projects is to be judged of by the locomotive capability that has, hitherto, been practically realized by the most successful steam-vessels of the present day."

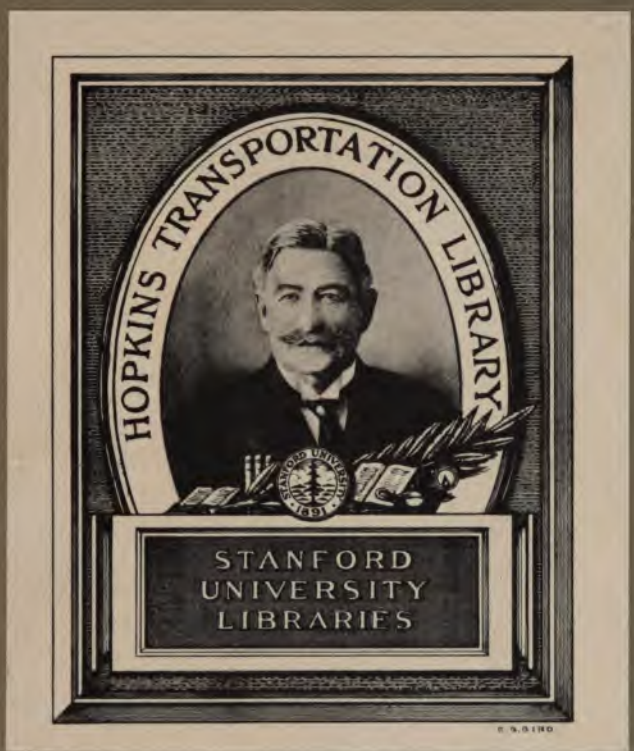
In conclusion, Mr. ATHERTON would remark that Engineers must be struck with astonishment at the readiness with which capital still continues to be advanced in Great Britain for the prosecution of any enterprise however unprecedented in character or stupendous in point of ideal or material magnitude, provided only that it have the sanction of scientific authority. As a Member of the Institution of Civil Engineers, Mr. A. regards it incumbent on the Institution generally, and on its individual Members respectively, to promote to the best of their individual ability and conviction of the truth sound and realisable progress in science, as practically conducive to sound and profitable pecuniary investment, and to uphold the confidence with which Engineering as a profession embodied at

* *The second issue of* this work extended to meet the case of vessels of unprecedented *magnitude, is now* being published by GRANT, Woolwich.

the INSTITUTION is publicly honoured by endeavouring to moderate all such expectations on PROJECTS *brought before the* INSTITUTION as may appear on discussion to be based on questionable grounds in mechanical science. It is with this purpose that Mr. A., after having given his attention to the almost novel study of "Steam Ship Capability," as respects the combined relations of Tonnage, Displacement, Power, Speed, Length of Passage, Cargo, and Coal, in connection with different types of build and of engine adaptation thereto, and having already appeared before the public on this subject by his publications thereon, was induced to take part at the Institution of Civil Engineers in the discussion proposed by the Council themselves. "On the CAPABILITY *of the proposed* LARGE CLASS OF STEAMERS;" and holding the opinion that the undoubtedly superior dynamic capability of large ships as compared with smaller vessels will be most advantageously developed by the superior PECUNIARY ECONOMY at which any given service will be performed on *equal conditions as to speed and distance, without re-coaling*, rather than by the TIME-ECONOMY resulting from the combination of a *high rate* of speed with an *increased length of passage, without re-coaling*, as proposed by the prospectus of the project especially under consideration; feeling also that the public generally are little aware of the practical difficulties which attend the plausible combination of high speed with great distance without re-coaling, he (Mr. A.) thought proper, for the reasons above stated, not to remain silent, but to announce his views at the Institution. Mr. A. is open to any equally comprehensive elucidation of the subject which other Members may have to advance; but he regrets having experienced that the action of the Institution in regard to this discussion on the "Capability of Large Steamers," as virtually brought before the public by its PRIVATE PRESS REPORTS, and by the action of an individual MEMBER of the COUNCIL, beyond the sphere of the INSTITUTION itself, (see *Times*, 28th Feb. 1854) has t ended to compromise his professional character, and has rendered the foregoing exposition on his part a matter of personal obligation; unwelcome, perhaps, to some individuals connected with the projects referred to, towards whom Mr. A. entertains the highest personal regard and the most sincere good wishes for their professional success.

CHARLES ATHERTON.

WOOLWICH DOCKYARD,
20th April, 1854.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